Building a Network of Research in Children's Environmental Health

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We are all aware that children are exposed to a variety of environmental hazards, including indoor and outdoor air pollution, solvents, pesticides, lead, mercury, and other heavy metals. Moreover, there has been an increase in certain childhood diseases, such as asthma and leukemia, and in some learning disabilities. It is recognized that these health impacts can be particularly detrimental for children because of pronounced differences in the nature and extent of environmental exposure as well as in functional development when compared to adults. In response to this heightened awareness and seizing a need for more attention to these issues across all levels of the federal government, the federal Executive order of 21 April 1997, "Protection of Children from Environmental Health Risks and Safety Risks," charges agencies to consider special environmental risks to children in their activities. In response, the National Institute of Environmental Health Sciences, the U.S. Environmental Protection Agency, and the National Center for Environmental Health, Centers for Disease Control and Prevention, have come together to implement a program to foster research that will ultimately reduce the extent of adverse human health effects occurring as a consequence of exposure to hazardous environmental agents.

This new program is known as Centers for Children's Environmental Health and Disease Prevention Research. These centers will develop multidisciplinary basic and applied research, in combination with community-based prevention research, to support studies on the causes and mechanisms of children's disorders having an environmental etiology; identify relevant environmental exposures; intervene to reduce hazardous exposures and their adverse health effects; and eventually decrease the prevalence, morbidity, and mortality of environmentally related childhood diseases.

The overarching aims of Centers for Children's Environmental Health and Disease Prevention Research are as follows :

- To provide for multidisciplinary interactions among basic, clinical, and behavioral scientists as a means of establishing outstanding, state-of-the-art research programs addressing environmental contributions to children's health and diseases.
- To support a coordinated program of research/prevention centers pursuing high-quality research in environmental aspects of children's diseases, with the ultimate goal of facilitating and accelerating translation of basic science knowledge into clinical applications or intervention strategies that can be used to reduce the incidence of environmentally related childhood diseases.
- To develop fully coordinated programs that incorporate exposure assessment and health effects research with development and validation of risk management and health prevention strategies
- To establish a national network that fosters communication, innovation, and research excellence, with the ultimate goal of reducing the burden of morbidity among children as a result of exposure to harmful environmental agents

Each center is designed around a central scientific theme, focused on the role of environmental agents in one of the following research foci: children's respiratory disease; childhood learning; growth and development. Basic biomedical research projects and a community-based prevention/intervention research component are incorporated within each center. For all of the identified research foci, substantial effort is devoted to mechanistic studies of toxicity in both laboratory and population-based studies. State-of-the-art exposure assessment techniques are included to precisely measure children's exposures. Moreover, centers are evaluating the contribution of genetic heterogeneity to disease processes. Information on individual variability with respect to chemical sensitivity and metabolism of xenobiotic agents has a significant role in defining disease onset and progression. These types of collaborative, multidisciplinary research approaches are required to explore the dynamic interaction of children with their environment.

It is important to note that this center program emphasizes integration of basic laboratory science with applied intervention strategies. Centers incorporate exposure assessment and health effects research with development and validation of risk management and strategies for health prevention. Involvement of affected communities in planning, implementing, and evaluating this intervention effort is essential. Community-based prevention/intervention research not only expands our understanding of the causes and remedies of environmentally related disorders, but also enhances the capacity of communities to participate in processes that shape research and intervention approaches. By bridging gaps between basic and applied researchers and between institutional researchers and community members, this program will attempt to improve communication between these interested parties, which can lead to enhanced knowledge regarding detection, treatment, and prevention of environmentally related diseases in children.

The long-range goal of Centers for Children's Environmental Health and Disease Prevention Research is to promote translation of

basic research findings into applied intervention and prevention methods, thereby enhancing awareness among children, their families, and health care practitioners regarding detection, treatment, and prevention of environmentally related diseases and health conditions.

In September 1998, children's centers were established at the following eight institutions:

- The University of Southern California is developing a better understanding of how host susceptibility and environmental exposures contribute to children's respiratory disease. This research will provide health and environmental officials with a variety of useful intervention tools.
- The University of California at Berkeley is quantifying exposure of children in agricultural areas of California to pesticides and will determine the impacts of these exposures on growth and development. They will work with the farmworker community to investigate approaches for reducing these exposures.
- The University of Washington is investigating biochemical, molecular, and exposure mechanisms that define children's susceptibility to pesticides. This center will implement research and intervention projects among children of farmworkers in the Yakima Valley of Washington State.
- The University of Iowa is studying causes of airway disease in children from rural communities. They hope to gain a better understanding of such diseases and develop a multicomponent intervention approach for reducing these diseases.
- The University of Michigan is investigating childhood asthma and conducting assessments that will lead to neighborhood and household interventions to reduce risks. This research will fill critical gaps in our knowledge of environmental factors contributing to pediatric asthma.
- Johns Hopkins University is examining how exposures to environmental pollutants and allergens relate to asthma and other lung diseases in children living in the inner city of Baltimore. They will search for new ways to reduce asthma in children exposed to environmental pollutants.
- Mt. Sinai School of Medicine is studying risks in inner-city children to multiple known and potential neurodevelopmental toxicants. These exposures include pesticides and lead in their homes and dietary sources of polychlorinated biphenyls. The Center will partner with community groups in East Harlem to study effects of integrated pesticide management and dietary modification on the health of children.
- Columbia University is undertaking a comprehensive community-based assessment of environmental risks to African American and Latino infants and children. Researchers in the center will study the health consequences of residential sources of pollution and the ability of inadequate nutritional status to exacerbate impacts of environmental toxicants.

Members of these eight centers were brought together for the first time at the National Institute of Environmental Health Sciences, Research Triangle Park, North Carolina, in November 1998. This was the first opportunity for researchers to share information with each other pertaining to research and prevention strategies. The conference provided a forum for investigators to learn of common interests and approaches and to discuss continuing communications and potential interactions. As such, this conference represented the initial step in creating a national network of high-quality research focused on children's environmental health. As the program continues, we envision enhanced interactions between the centers, governmental and nongovernmental agencies that promote and support children's health, and members of affected communities.

The papers that follow give us the opportunity to introduce the reader to the vast array of research projects that are currently being undertaken this centers program. Each article provides the framework for the integrated research programs that the scientists are conducting. Four of the centers are investigating the role of the environment in the development of asthma. The articles from these centers describe the current state of research on the role of air pollutants, common allergens, organic dusts, and animal-driven proteins in the etiology of asthma in urban and rural environments. Understanding the complex interaction between these factors and the genetic predisposition to lung inflamation will provide strategies for intervention. Other centers are focused on the impact of exposure to environmental agents, especially pesticides, on the growth and development of children. In this issue of *Environmental Health Perspectives Supplements,* issues related to fetal exposures to pesticides and other agents, strategies for quantifying body burden of chemical mixtures to children, and programs to implement effective pesticide reduction programs in multiethnic communities will be discussed.

Scientists and community members working together can make substantial advances in our understanding of the mechanisms by which environmental agents affect children's health. As our program grows and matures, the sponsoring agencies and others will have the opportunity to turn research into practice, invigorate our efforts to reduce children's exposures to pollutants, and prevent many illnesses and conditions in our children.